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COUNTS OF CARNABY'S COCKATOO (*CALYPTORHYNCHUS LATIROSTRIS*) AND RECORDS OF FLOCK COMPOSITION AT AN OVERNIGHT ROOSTING SITE IN METROPOLITAN PERTH

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ABSTRACT

Opportunistic observations are reported on Carnaby's Cockatoo (*Calyptorhynchus latirostris*) made since 1981 in the western suburbs of Perth. Carnaby's Cockatoos were counted at a habitual roosting site on most evenings between April 2006 and April 2007. Although numbers of birds varied from zero to over 600 on any evening during this time, there was a clear annual trend of seasonal abundance. This confirmed the trend observed the previous year (January 2005 - March 2006) on the basis of sighting records. Lowest numbers occurred from August to October, after which they increased steadily to peak in March before steadily declining. On average flocks were found to comprise about 60% pairs and 40% triplets (comprising a pair and their fledged chick). These proportions were very consistent through the year. In the western suburbs remnant bushlands appear to provide the primary food resource for this cockatoo which has adapted behaviourally to this urban environment

INTRODUCTION

Carnaby's Cockatoo (*Calyptorhynchus latirostris*) is endemic to the south-west of Western Australia. It is considered Endangered under IUCN criteria (Burbidge 2004) and is currently listed as a threatened species under State and

Commonwealth legislation, due to a rapid decline in its numbers and distribution associated with land clearance in the wheatbelt and the Swan Coastal Plain. According to Shah (2006) there has been a 50% decrease in its abundance and distribution over the last 45 years.

A highly gregarious and mobile species, Carnaby's Cockatoo is thought to breed largely in the wheatbelt and move to the Swan Coastal Plain to feed in the non-breeding season (Davies 1966; Saunders 1977, 1980, 1990; Saunders and Ingram 1995, 1998). However, recent studies by Johnstone *et al.* (2005) indicate that this cockatoo is responding to reduction of its wheatbelt habitat by movement further westward and southward with breeding now recorded at several localities on the Swan Coastal Plain, including within the Perth metropolitan area.

Shah (2006) attempted to quantify the abundance of Carnaby's Cockatoo on the Swan Coastal Plain using volunteer observers. This study included counts at 16 roost sites on the Swan coastal Plain between Yanchep and Dawesville. At six of these roost sites, synchronous counts were made over nine consecutive days from 29 April to 7 May 2006. Counts made at the Hollywood roost site by me were contributed to Shah's study. The results presented here represent an extension of these Hollywood counts made on almost a daily basis from April 2006 to April 2007. They are the first attempt to systematically quantify abundance of this species throughout the year.

Despite its endangered status and the fact that Carnaby's Cockatoo is a conspicuous and majestic bird, well known in metropolitan Perth, there is little information about its habits or resource requirements in the suburbs. There are no previous published accounts of flock composition. The objectives of this study were to add longer-term quantitative information on its abundance and to contribute to knowledge about its resource requirements and behaviour, particularly in relation to seasonal changes in the urban environment of Perth's western suburbs.

METHODS

Observations on Carnaby's Cockatoo in the western suburbs of Perth were made opportunistically and recorded by me since 1981. In addition, counts were made from the Hollywood Primary School playing field around dusk most evenings from April 2006 to April 2007. Birds were counted in flight as they approached their habitual roosting trees (over a wide area of unobstructed sky) or relocated to them from adjacent trees. Counts of birds in trees were found to be unreliable (under-counts) and were not used. Numbers were scored in a notebook as distinguishable units (e.g. a typical

flock might score as 2,2,2,3,14,3,1; a total of 27 birds). Precedence was always given to obtaining an accurate total count rather than discriminating the numbers of pairs and triplets (pair of adults with a juvenile) within flocks. Discriminating pairs and triplets was therefore generally done when birds relocated into roosting trees as this usually occurred in these units, rather than in larger groups. Other information recorded was time of arrival of the first flock, weather conditions, including wind direction and strength, and time the last birds entered their roosting tree.

RESULTS

Observations

Carnaby's Cockatoos have roosted in the vicinity of Hollywood Hospital on Verdun Street, Nedlands for at least the last 26 years – the period that I have lived nearby. Their daily roosting behaviour follows a very predictable pattern. Each evening birds congregate at Karrakatta cemetery to drink from vases built into gravestones. (These are filled by the sprinkler system). They then fly into a group of large Lemon-scented Gums (*Eucalyptus citriodora*) in Hollywood Primary School located on the highest point in the vicinity (a direct distance of about 1000 m from the cemetery in a NE direction). Here they rest and some feed juveniles before relocating, generally in pairs, triplets or small groups, a further 200m to their preferred roosting trees, another group of *E. citriodora* in the Hollywood Hospital car park. This car park is illuminated throughout the night and traffic and human activity occurs beneath them. Although there were variations to this pattern it was very rare for flocks to approach the roosting site from any direction other than the SW. Flocks occasionally flew directly into their roosting trees without relocating from nearby trees. Trees other than the *E. citriodora* in Hollywood Hospital car park were sometimes used for roosting. However, these were all within a few hundred metres and were generally also *E. citriodora*, although *E. maculatus* and *E. robusta* (which has a rough-bark trunk) were also used.

Birds that roosted overnight dispersed at dawn as a large flock or flocks. The direction taken each day was variable, and large flocks were regularly encountered foraging and feeding in nearby bushlands when I was clearing pit traps daily soon after dawn (Shenton Bushland (1994-2006), Underwood Avenue Bushland (1998-2001), Hollywood Reserve and the small bushland on Monash Avenue in Sir Charles Gairdner Hospital grounds (2001-2002)). The apparent low wing loading and slow flight of Carnaby's Cockatoo enables it to spot food plants on the wing. However, if these are limited in

number, while some birds land and start to feed, the rest of the flock will continue on its foraging flight. Although feeding birds may remain in contact vocally and rejoin the original flock, this may not necessarily be the case and it appears that during the course of the day the large flocks progressively break up into smaller aggregations and sometimes even single pairs or triplets. Re-aggregation into large flocks in Hollywood occurred each evening just before dusk when birds gathered at the Karrakatta Cemetery to drink before flying to their overnight roost. (They have also been observed drinking at Perry Lakes on several occasions in the 1990s, but this appears to have ceased recently with the drying of the lakes).

Although I have no evidence of Carnaby's Cockatoo breeding in the western suburbs, birds were observed inspecting hollows at Shenton Bushland, Underwood Avenue Bushland and even the wooden lighting poles at the Hollywood playing fields (some of which are hollow at their tops). In the winter/spring of 2006 a pair or single male bird was regularly sighted in the Hollywood area. Their behaviour and the time of year suggested that they may have been breeding, but a nest was not discovered.

Sighting records in the vicinity of the Hollywood roost site from January 2005 - March 2006 are presented in Table 1. These show an annual trend for the highest number of days birds were sighted to be from mid-summer to autumn (December to April) declining thereafter through winter to spring (May to November). Although bird numbers were generally not recorded, the winter/spring sightings usually involved much lower numbers – sometimes just pairs or single individuals.

Average monthly counts between April 2006 and April 2007 are presented in Figure 1 and Table 2. Although birds were recorded roosting in every month of the year, there was a clear trend of seasonal abundance, but with a high degree of variation. The average number roosting was at its lowest levels during winter and spring (July to November) after which there was a gradual increase in numbers through late summer and into autumn, peaking in March and with a rapid drop-off after May.

Daily counts for the period 1 May 2006 to 23 July 2006 and 1 December 2006 to 23 April 2007 are presented in Figures 2 and 3 respectively. These demonstrate in more detail the trend evident in Figure 1. They also show the high daily variation in numbers of birds recorded roosting. Hot days with a strong sea breeze appeared to correlate with unusually low numbers of birds roosting at the Hollywood site (see Fig. 3).

Monthly proportion of single birds, pairs and triplets (pair with juvenile) are presented in Table 1.

Table 1. Sightings of Carnaby's Cockatoos in the vicinity of a roost site at Hollywood, Perth from January 2005 to March 2006.

Month	Jan-05	Feb	Mar	Apr	May	Jun	Jul	Au	Sep	Oct	Nov	Dec	Jan-06	Feb	Mar
Number of recording days	22	15	22	28	25	22	18	31	30	31	25	22	20	19	31
% of days with sightings	77	100	100	100	92	27	89	48	70	65	68	91	100	100	100

Table 2. Roost site counts of Carnaby's Cockatoos and proportions of single birds, pairs and triplets (pairs with juvenile) where these were discriminated within flocks at Hollywood, Perth from April 2006 to April 2007. (Dashes = no records).

Month	Apr-06	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr-07
Max	250	450	239	166	2	0	4	37	183	230	321	676	387
Min	200	14	0	0	0	0	0	0	0	4	115	74	0
Mean	222	205	63	27	0.1	0	0.3	6	54	138	203	291	161
± SD.	26	130	71	53	0	0	1	8	54	61	44	150	121
Number of recording days	5	29	21	16	17	26	31	18	26	19	26	21	22
Mean % single birds	-	4.6	0.9	0	-	-	-	-	2.4	5.6	4.5	5.8	7.0
Mean % of pairs	-	59.4	60.9	62.7	-	-	-	-	60.0	55.3	58.8	53.8	54.5
Mean % with juvenile (triplets)	-	36.0	38.2	37.3	-	-	-	-	37.6	39.1	36.7	40.4	38.5
n (# singles, pairs & triplets counted)	-	453	699	110	-	-	-	-	170	486	1093	549	299

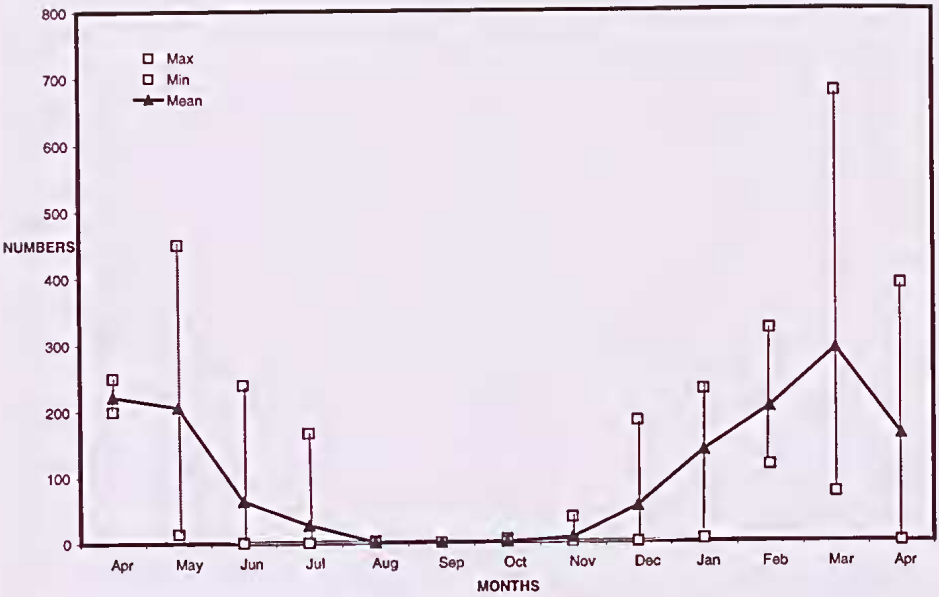

Figure 1. Average monthly numbers of Carnaby's Cockatoos from April 2006 to April 2007 at the Hollywood roost site.

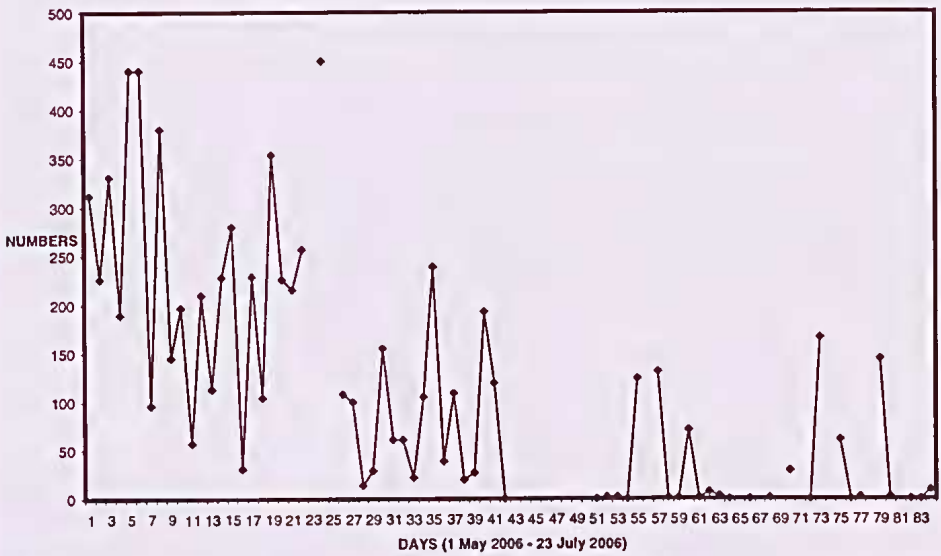

Figure 2. Daily counts of Carnaby's Cockatoos at the Hollywood roost site from 1 May 2006 to 23 July 2006.

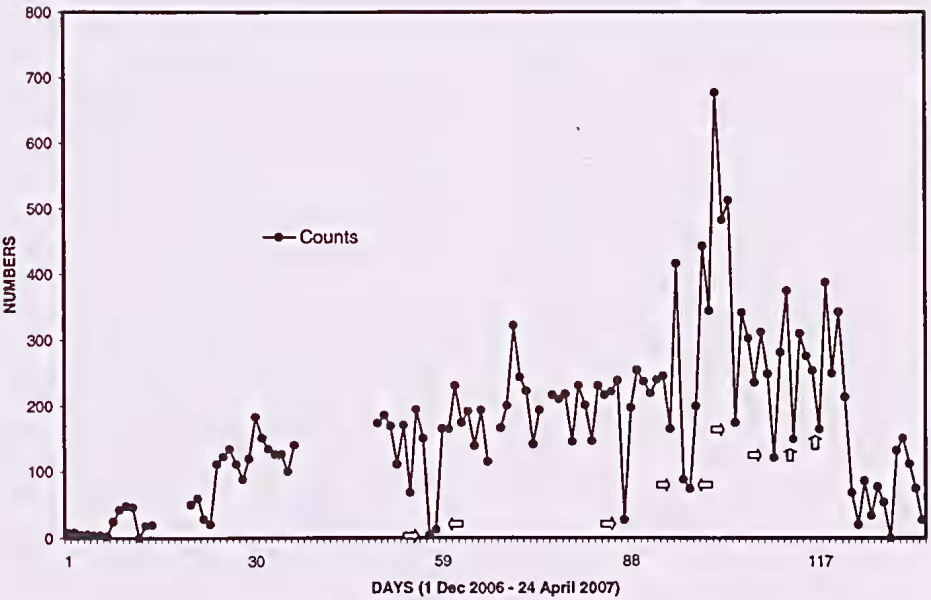

Figure 3. Daily counts of Carnaby's Cockatoos at the Hollywood roost site from 1 December 2006 to 23 April 2007. Arrows = hot easterly winds with no or light sea breeze.

The proportion of pairs remained consistently at about 60% and triplets at just below 40%. A low (7% maximum) and variable proportion of single birds was recorded. However, because these birds' behaviour usually involved much calling, erratic flying and sometimes reunions, it is concluded that they were mostly individuals that had become temporarily separated from their parents or mates.

DISCUSSION

Accuracy of counts

I am confident that a very high degree of count accuracy was achieved. This is because of the birds approaching the roost site from the same direction most nights and because they were visible flying over a wide expanse of uninterrupted skyline. Inaccuracies in counts were most likely to have occurred on the few occasions when large flocks (> 200 birds) arrived synchronously. However this was unusual and it would not account for the high degree of daily variation in numbers of birds recorded.

Roost fidelity

Shah (2006) recorded only two overnight roosts in the western suburbs of Perth – one at

Hollywood and one at Perry Lakes. These are situated approx. 4 km apart in a direct line. The former is central to Kings Park, Shenton and Underwood Avenue Bushlands, while the latter is close to Bold Park and Underwood Avenue Bushland. These two sites appear to be isolated from the nearest roost to the south at Bentley, approx 12 km away, by the Swan river (although a flock of > 80 birds was observed crossing the Swan from the Old Brewery to the south shore of the Narrows at 5.15 pm on 5 April 2006). To the north they are isolated by suburbia and the nearest roost recorded by Shah is at Gnangara, approx. 25 km away. It therefore seems likely that Carnaby's Cockatoos feeding in the western suburbs bushlands roost almost exclusively either at Hollywood or Perry Lakes, probably depending on their proximity to either each evening. This is supported by a single record by Shah of 250 birds roosting at Perry Lakes on 14 May 2006. On the same evening I recorded 280 birds roosting at Hollywood, so clearly the daily counts recorded at the Hollywood site in this study do not necessarily reflect the total number of birds feeding in the western suburbs on any day. The maximum count at Hollywood that month was 450, consistent with all local birds roosting there that night, (see Table 2). Thus it is concluded that roost fidelity by Carnaby's Cockatoo is probably to a 'network' of roost sites on the Swan Coastal Plain. Birds probably use the Hollywood and Perry Lakes sites interchangeably while feeding in the bushlands of Perth's western suburbs, but there is also probably some interchange with sites to the north and south.

Flock composition

As priority was always given to obtaining a total count of birds roosting and the proportion of the total birds roosting discriminated as triplets, pairs or single birds was therefore variable, the frequency of triplets, pairs or single birds counted must be interpreted with caution. It seems reasonable to assume that the discriminated birds represent a valid sub-sample of the total flocks. The consistency of the results appears to support this and I strongly believe that all the flocks observed in this study were entirely composed of triplets, pairs or single birds. I have no reason to believe that units of four birds was a pair and two juveniles, though this possibility cannot be totally discounted in some instances. In other words the birds not discriminated within flocks did not, on the basis of my observations, represent large groups of single (unpaired) birds flying together. From December 2006 to April 2007 a slight upward trend in mean monthly percentage of single birds was recorded. While it is tempting to interpret this as progressive independence of

juveniles from their parents, this is not supported by the proportion of pairs, which trends slightly down over the same period, not up as would be expected.

If the single birds recorded were either mates or juveniles that have become separated, what does this say about the composition of flocks of Carnaby's Cockatoo on the Swan Coastal Plain? If approx. 40% represent a breeding pair and their juvenile of the last breeding season, then 13.3% of the birds are juveniles, 26.6% are adults that successfully bred and the balance of approx. 60% must be made up of birds which failed to breed and paired sub-adults which, according to Johnstone and Storr (1998), breed for the first time at four years of age. This interpretation suggests that either juveniles aggregate in flocks that do not roost in the Perth area or that Carnaby's Cockatoos form pair bonds soon after separating from their parents, possibly in their second year of life.

General

Carnaby's Cockatoos that have been recorded roosting in the same vicinity in Hollywood for the last 26 years are clearly birds that move into the western suburbs primarily to feed in the remnant bushlands. While Kings Park and Bold Park are the largest of these, the smaller bushlands that lie between these also contribute to the total food resource and even a block of bush as small as 0.75 ha in area (Monash Avenue bushland) was recorded to be used. Based on the work of Cooper *et al.* (2002) who determined basal energy requirements of Carnaby's Cockatoo as well as the energy content of some of its food plants (but not the energy cost of foraging), a significant food supply would be required to support the large numbers of birds recorded regularly from the western suburbs. The western suburbs do not have extensive areas of *Pinus* spp. unlike other foraging/roost sites in the metropolitan area (e.g. Bentley and Gnangara) and Carnaby's Cockatoo is therefore probably largely dependant on the remnant native bushlands for food. Thus any diminution of the total area of remnant bushland in the western suburbs is likely to adversely impact on the food resource locally available to these birds. It seems probable that the location of the traditional roost site at Hollywood, approximately central to these bushlands, is related to energetics. The birds are able to feed soon after dawn from a known food source in close proximity. Carnaby's Cockatoos seldom fly into the wind while foraging and at Hollywood they "ride" the sea breeze to reach their roost site each evening. Further observation may reveal that the daily foraging route taken correlates with wind direction and strength.

Carnaby's Cockatoos are clearly

highly intelligent and adaptable birds. At Hollywood they roost exclusively in eastern states eucalypts in an illuminated car park with human and vehicle activity going on beneath them. They drink every evening from vases in Karrakatta cemetery in the reticulated lawn area which involves searching for the areas that have recently been watered. They have learned to feed on a variety of exotic plants (see Shah, 2006), of which *Pinus* spp. are of particular importance in areas where native bushland no longer exists, because of their high energy value (Cooper *et al.* 2002). They have also become very tame and tolerant of humans and human activity which may account for recent nesting records from the Swan Coastal Plain, including the metropolitan area (Johnstone *et al.* 2005). The possibility that Carnaby's Cockatoo may start to breed in the western suburbs bushlands therefore cannot be discounted.

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